Englisia
Journal of Language, Education and Humanities
ISSN:
2089-6239 (Print)
2549-0648 (Online)

Digital literacy research trends and collaborations in EFL classrooms: A bibliometric analysis of language learning transformation

ABSTRACT - The rapid advancement of digital literacy has catalyzed the transformation of technology-based English as a Foreign Language (EFL) instruction. Nevertheless, comprehensive mappings of research trends, thematic focal points, and current scholarly collaborations remain insufficiently integrated. Moreover, the scarcity of empirical research has often compelled teachers and learners to develop technological innovations independently. This study seeks to delineate the trajectory of digital literacy research within technology-based EFL learning, focusing on prevailing themes, patterns of research collaboration, and projected directions. Employing a qualitative bibliometric approach, this study analyzes 55 documents indexed in Scopus over the past five years, with data visualization conducted using RStudio. The findings reveal a pronounced emphasis on cognitive enhancement, the predominance of Mobile-Assisted Language Learning (MALL) and self-directed learning as the most highly cited concepts, the emergence of two principal thematic clusters-digital literacy with learning autonomy, and digital literacy with Computer-Assisted Language Learning (CALL)-as well as a robust regional collaboration network within Southeast Asia. These results confirm that digital literacy, EFL, and CALL constitute the core thematic foundations of technology-mediated language learning. Concurrently, the findings underscore the necessity for further research employing mixed-methods designs to develop a more holistic understanding of how to foster sustainable innovation in EFL learning grounded in digital literacy.

Farhaini Uswah[1*]
Bambang Widi Pratolo[2]
Ani Susanti[3]
[1,2,3]Department of English Language, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
[*]*Corresponding email;*
2507042006@webmail.uad.ac.id

Article History
Submitted: 9 November 2025
Accepted: 7 March 2026
Published: 31 May 2026

Keywords
Digital literacy; EFL learning; Transforming technology; Bibliometric analysis

Recommended APA Citation
Uswah, F., Pratolo, B. W., & Susanti, A. (2026). Digital literacy research trends and collaborations in EFL classrooms: A bibliometric analysis of language learning transformation. *Englisia: Journal of Language, Education, and Humanities, 13*(2), 74-89. https://doi.org/10.22373/englisia.129

1. Introduction

The era of digital disruption, commonly described as Industrial Revolution 4.0 and Society 5.0, has fundamentally reshaped English as a Foreign Language (EFL) education, requiring a transition from traditional instruction to technology-enhanced learning environments (Bellet et al., 2025; Kurniadi et al., 2025). This transformation goes beyond tool adoption, requiring cognitive, behavioral, and ethical competencies that enable learners and teachers to engage effectively with digital technologies (Prosenjak & Jakupčević, 2025).

Consequently, digital literacy has emerged as a key determinant of successful pedagogical adaptations in 21st-century EFL learning (Palacios-Hidalgo & Huertas-Abril, 2025). Digital literacy plays a crucial role in technology-mediated language learning. Teachers already familiar with digital literacy generally possess basic digital skills, while pre-service teachers, particularly in distance education contexts, report a lack of development in digital literacy, revealing a structural gap between teacher education curricula and evolving technological demands (Anggeraini et al., 2019; Esfandiari & Meihami, 2023; Palacios-Hidalgo & Huertas-Abril, 2025).

Despite a growing number of empirical studies on digital literacy, AI, and technology-enhanced EFL learning, existing research remains fragmented, thematically dispersed, and largely focused on isolated pedagogical outcomes rather than systematically mapping research trends, dominant themes, and collaborative networks at the macro level. This lack of integrative synthesis represents a clear research gap, particularly in understanding how digital literacy functions as a foundational construct within broader technological transformations in EFL.

Therefore, this study aimed to map and synthesize recent Scopus-indexed research on digital literacy in technology-enhanced EFL learning using a bibliometric approach. Specifically, this study aimed to answer the following research questions: (1) What are the dominant research themes and conceptual structures related to digital literacy in EFL? (2) How have research trends and thematic emphases evolved over the past five years? and (3) What patterns of institutional and international collaboration characterize this field?

2. Literature review

2.1. Digital literacy

Digital Literacy (DL) has taken on a central role as a fundamental skill required by both learners and teachers of English as a Foreign Language (EFL). DL is a strong predictor of how EFL students integrate Artificial Intelligence (AI) into independent learning practices (Huang & Derakhshan, 2025). In addition, Digital literacy is the skill needed to live, learn, and work in a society where communication and access to information are done through digital technologies such as internet platforms, social media, and mobile devices (Hutchinson & Novotny, 2018).

Researchers have provided several definitions of digital literacy. Gilster and Glister, (1997) were the first to propose the concept of digital literacy. They considered it a set of students' abilities and skills to use the internet only to obtain official information within the school framework. Along with that, digital literacy, with its changes, expansions, and evolutions, also includes other concepts such as image literacy (George & Sanders, 2017), reproductive

literacy (Gisbert & Lázaro, 2015), information literacy (Gruszczynska & Pountney, 2013), and social-emotional literacy (Gudmundsdottir & Hatlevik, 2018).

Digital literacy does not necessarily mean mastering a set of skills and abilities for managing online data. This essential skill can help people identify, access, manage, share, evaluate (Alavi et al., 2022), integrate digital resources, produce knowledge, create new media terms, and build relationships with others (Gurevich et al., 2017; Hutchinson & Novotny, 2018; Ilomäki et al., 2016). From this perspective, digital literacy goes beyond simply acquiring basic information and communication technology skills for technology applications, including people's awareness, attitudes, and abilities to identify, access, manage, resolve, evaluate, analyze, and integrate digital content and resources, create new knowledge, create media expressions, and communicate with others in the context of specific life circumstances (Ilomäki et al., 2016; Kyeong-Ouk Jeong, 2017; List, 2019).

Therefore, bibliometric analysis is needed to map and observe the development trends of digital literacy research in EFL. Bibliometric analysis is a research method used to identify, classify, and analyze literature on a research topic (Donthu et al., 2021). In academic studies, bibliometric analysis evaluates research trends, author contributions, and citation patterns related to a particular discipline (Hassan & Duarte, 2024). This technique can produce citation, co-citation, and co-word analyses, as well as keywords, themes, and clusters. Furthermore, bibliometric analysis can facilitate researchers' understanding of theoretical and methodological developments, as well as the relationships between concepts in the literature (Suyanto et al., 2023).

2.2. Dynamic of English as a foreign language (EFL) in the digital era

One of the primary goals of education is to create meaningful and appropriate classroom change (Murphy & Lebans, 2009). Naturally, one such factor can be teachers' digital literacy (Palacios-Hidalgo & Huertas-Abril, 2025). To improve this literacy, teachers must respond positively to modern and inevitable changes and adapt to them (Pérez-Escoda et al., 2019). They must change their traditional ways of teaching, thinking, and perspective to improve their classroom teaching (Pettersson, 2018).

Many studies have confirmed this fact (Carolus et al., 2023; Gurevich et al., 2017; Hutchison, 2012; Kyeong-Ouk Jeong, 2017; Zimmer et al., 2021). For example, Pérez-Escoda et al. (2019) argue that teacher identity is related to the use of digital tools, appropriate technology use, the expression of personal views, and understanding of skills and confidence in digital environments. Another factor in improving teachers' digital literacy is access to digital facilities and resources. Access to technology can increase innovation in teaching and learning methods (Instefjord & Munthe, 2017). Based on List's (2019) research, teachers can improve their digital skills, develop creativity and problem-solving skills, and become more independent in learning and teaching by using various digital technologies. Given the importance of digital literacy, teachers can help disinterested and hesitant students to take initiative and collaborate in classroom activities. They can foster independence and cognitive and metacognitive awareness (Murphy & Lebans, 2009). Furthermore, the use of digital tools facilitates and strengthens

teachers' remote participation capabilities (Bond et al., 2019). Digitally literate teachers can pave the way for students to experience the joy of freedom of action, encouragement, motivation, and success in their personal and academic lives (Gudmundsdottir & Hatlevik, 2018).

3. Method

This research uses a quantitative method with a descriptive bibliometric analysis approach. Fifty-five research papers were retrieved from Scopus using the search keywords "Digital Literacy" and "EFL" within the last five years (2021-2025). The inclusion criteria for the research limitations are: 1) Document type: Article; 2) Publication stage: Final; 3) Keywords: "Digital Literacy" and "EFL"; 4) Source type: Journal; 5) Language: English. Meanwhile, the research exclusion includes documents that are not in the form of scientific articles, such as *conference papers*, *book chapters*, *review articles*, *editorials*, or *reports*. In addition, articles that had not reached the final publication stage or were still in in-press or early-access status were excluded from the analysis. Publications written in languages other than English were also excluded. Data collection and data processing for this study were conducted on October 23, 2025.

This research analysis used the RStudio application to visualize the research data findings. The reason for using RStudio software in this study is that it is relevant to big data research for bibliometric analysis (Erümit et al., 2024; Özdoğan Sarıkoç, 2024). Furthermore, digital literacy and EFL have not been widely studied using a bibliometric approach. Therefore, this research is important to examine in greater depth to provide information on digital literacy and EFL research topics over the last five years. The bibliometric indicators used in the analysis include: metadata completeness, the ten most cited articles, publication trends over the past five years (2021–2025), relevant affiliations, co-occurrence networks, thematic maps, and world maps of countries' collaborations.

4. Findings and discussion

Digital literacy has become a central accelerator in transforming technology-based learning models in EFL classrooms. It is no longer a complementary skill but an essential prerequisite for optimizing digital tools in language acquisition (Milenkova et al., 2020). Although integrating an LMS and online resources can significantly enhance learner autonomy and engagement, their effectiveness depends on students' critical ability to navigate and evaluate digital information (Flamarique et al., 2019).

At the same time, teachers face the challenge of continuously adapting their pedagogical strategies to rapid technological change (Javed, 2024). Effective technology use requires not only technical familiarity but also pedagogical alignment with learning objectives, ensuring that digital tools genuinely strengthen language competence (Lai et al., 2016). However, digital distractions remain a serious concern, potentially reducing students' focus and motivation (Halpern et al., 2020). Analysis of 55 Scopus-indexed datasets reinforces the urgency of these challenges and highlights the need to prioritize teacher professional development programs to foster adaptive, safe, and innovative digital learning environments (Saykili, 2024).

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0.00	Excellent
C1	Affiliation	0	0.00	Excellent
AU	Author	0	0.00	Excellent
CR	Cited References	0	0.00	Excellent
DT	Document Type	0	0.00	Excellent
SO	Journal	0	0.00	Excellent
DE	Keywords	0	0.00	Excellent
LA	Language	0	0.00	Excellent
PY	Publication Year	0	0.00	Excellent
TI	Title	0	0.00	Excellent
TC	Total Citation	0	0.00	Excellent
DI	DOI	4	7.27	Good
RP	Corresponding Author	8	14.55	Acceptable
ID	Keywords Plus	53	96.36	Critical
WC	Science Categories	55	100.00	Completely missing

Figure 1. Completeness of metadata - 55 docs from Scopus

The metadata quality analysis in Figure 1 shows a solid completeness of core data elements; eleven key fields, including Cited References (CR), have now achieved Excellent status with 100.00% completeness, ensuring the reliability of the baseline data for citation identification and analysis. While the DOI (DI) and Corresponding Author (RP) fields are at Good and Acceptable statuses (with 7.27% and 14.55% missing data, respectively), critical attention should be drawn to two significant deficiencies: Keywords Plus (ID) was identified as Critical (96.36% missing) and Science Categories (WC) was rated Completely Missing (100.00% unavailable). The complete loss of Science Categories data provides strong academic justification for the novelty of our study, "Digital Literacy in EFL Classrooms: Transforming Technology-Based Language Learning." Due to the lack of automated and reliable disciplinary classification, EFL teachers and students cannot fully rely on database systems. This situation reinforces the argument that Critical Digital Literacy is a prerequisite, requiring learners to develop independent evaluative and classification skills. Therefore, this research, based on 55 Scopus big data sources, is important because it shifts the focus from simply using technology to strengthening cognitive skills that enable learners to navigate and filter information effectively, ensuring they can transform unclassified information into contextual, relevant knowledge in technology-based language learning. An interesting finding from these results is the reframing of digital transformation as cognitive empowerment—positioning learners as active interpreters who transform unclassified digital information into meaningful, discipline-relevant knowledge. The next step in the analysis was to identify and discuss the 10 most-cited studies, as presented in Table 1.

Table 1

Top ten research on digital literacy and EFL.

Document title	Authors	Source	Year	Citations
Facilitating Sustainable Self-Directed Learning Experience with the Use of Mobile-Assisted Language Learning	Jeong, K.-O.	Sustainability Switzerland, 14(5), 2894	(2022)	70
Digital literacy of EFL students in a junior high school in Iran: voices of teachers, students and Ministry Directors	Dashtestani, R., Hojatpanah, S.	Computer Assisted Language Learning, 35(4), pp. 635–665	(2022)	59
Digital Literacy of EFL Students: An Empirical Study in Vietnamese Universities	Nguyen, L.A.T., Habók, A.	Libri, 72(1), pp. 53–66	(2022)	38
The Research Competence, Critical Thinking Skills and Digital Literacy of Indonesian EFL Students	Indah, R.N., Toyyibah, Budhiningrum, A.S., Afifi, N.	Journal of Language Teaching and Research, 13(2), pp. 315–324	(2022)	32
EFL teachers' digital literacy: the role of contextual factors in their literacy development	Zhang, J.	Frontiers in Psychology, 14, 1153339	(2023)	29
TPACK-SAMR digital literacy competence, technostress, and teaching performance: Correlational study among EFL lecturers	Muslimin, A.I., Mukminatien, N., Ivone, F.M.	Contemporary Educational Technology, 15(2), ep409	(2023)	22
Pre-service teachers' conceptions and competences on digital literacy in an EFL academic writing setting	Nabhan, S.	Indonesian Journal of Applied Linguistics, 11(1), pp. 187–199	(2023)	19
The effects of computer anxiety and self-efficacy on L2 learners' self-perceived digital competence and satisfaction in higher education	Katsarou, E.	Journal of Education and E Learning Research, 8(2), pp. 158–172	(2021)	16
The effects of MALL training on preservice and in-service EFL teachers' perceptions and use of mobile technology	Hafour, M.F.	Recall, 34(3), pp. 274–290	(2022)	14
Modeling the Contribution of EFL Students' Digital Literacy to Their Foreign Language Enjoyment and Self-Efficacy in Online Education	Feng, L.	Asia Pacific Education Researcher, 33(4), pp. 977–985	(2024)	12

Source: Scopus data processed by the author, 2025

Analysis of Table 1 above shows that the ten most cited articles on Digital Literacy in English Language Learning (EFL) from 2021 to 2025 demonstrate a strong, highly relevant research focus. The data clearly demonstrates a surge in publications, with eight out of ten articles published between 2022 and 2023, reflecting the academic community's rapid response and prioritization of post-pandemic digitalization issues. The core topic most frequently studied is the evaluation of EFL students' digital literacy competencies in diverse geographic contexts (such as Iran, Vietnam, and Indonesia). In this area, studies by Dashtestani and Hojatpanah (2022) and Nguyen and Habók (2022) are the main contributors to citations. Interestingly, Jeong's (2022) study, focusing on Mobile-Assisted Language Learning (MALL) and Self-Directed Learning, stands out with the highest number of citations (70), underscoring the significant academic significance of integrating mobile technology and learning autonomy. Furthermore, we observe a shift in trends; The research focus extends from students to EFL teachers (Muslimin et al., 2023; Zhang, 2023), with an emphasis on the role of contextual factors and pedagogical models (such as TPACK-SAMR) in developing educators' digital competencies. In summary, the high volume of citations in this short period of time clearly confirms that the technology-based language-learning transformation is a highly active, crucial, and multidimensional issue in today's global academic discourse.

These findings confirm that EFL digital literacy has become increasingly popular in the past five years. This trend is strongly supported by the rapid advancement of digital technology, which is widely adopted in the education sector to enable creative learning and innovative teaching methods. This trend is supported by research data from 55 Scopus documents, which show a significant increase in the number of EFL digital literacy indicators in the past two years. More details are shown in Figure 2 below.

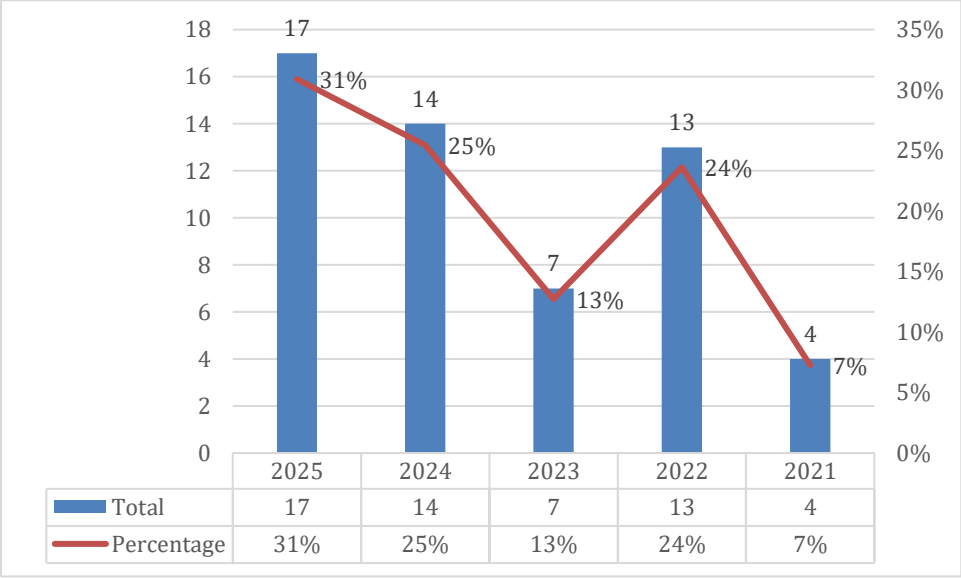

Figure 2. Development of digital literacy research in EFL in the last five years

The annual publication trend chart for the period 2021 to 2025 provides a dynamic perspective that directly reinforces the urgency of research on Digital Literacy in EFL

Classrooms. The trend indicates a surge in research interest in this area. However, 2021 saw the lowest volume (4 articles); there was a substantial increase in 2022 (13 articles), followed by a significant increase in 2024 (14 articles), and reaching a peak in 2025 (17 articles). These surges collectively indicate that the topic of technology-based language learning transformation has reached a crucial level of academic recognition and attention. Fluctuations in volume—including a moderate decline in 2023 that subsequently recovered—likely reflect the post-digital acceleration adjustment phase triggered by the pandemic. The massive surge in publications in 2024 and 2025 (accounting for 31% of the total) indicates that the research community is now actively and heavily invested in measuring, evaluating, and refining the implementation of Digital Literacy in EFL classrooms. Given this explosion of literature, this research is highly relevant; It not only enriches the growing body of knowledge but also offers timely analysis to guide pedagogical practice amidst the intensifying wave of research. This trend confirms that studying the impacts, challenges, and strategies for enhancing digital competencies is an urgent academic need to ensure the effectiveness of future language learning transformations. Further analysis to identify the most relevant affiliations to the theme of Digital Literacy in EFL Classrooms is shown in Figure 3 below.

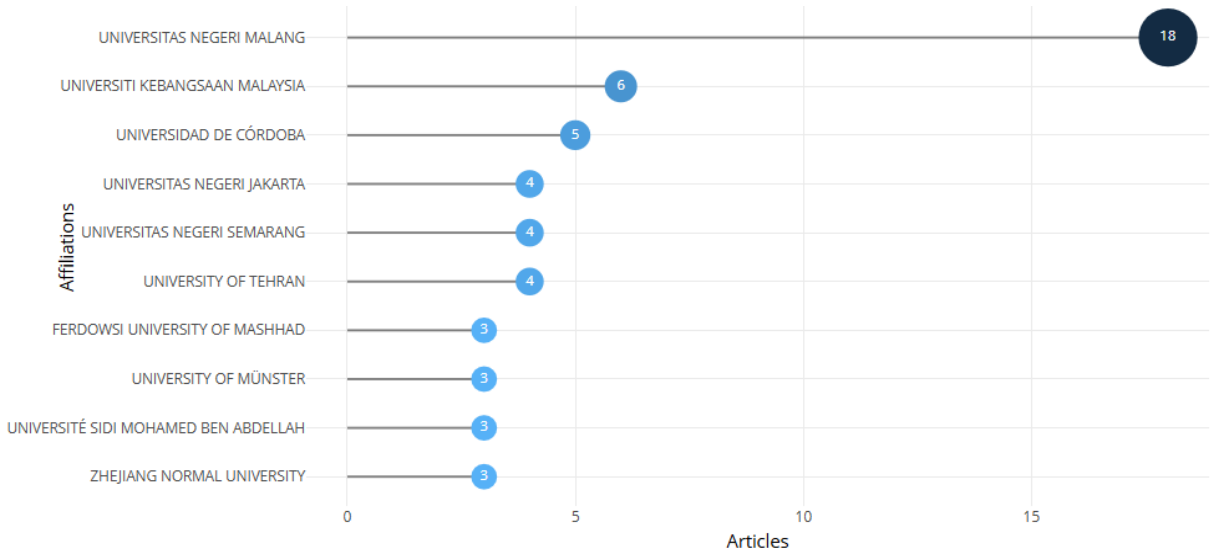

Figure 3. Most relevant affiliations

Figure 3. The analysis of institutional affiliations above shows that contributions to publications on Digital Literacy in EFL Learning are concentrated in Southeast Asia and the Middle East. Universitas Negeri Malang (UM) demonstrates remarkable dominance with 18 articles, firmly securing its position as the most productive research center and far surpassing other contributors. Other Indonesian affiliates, such as Universitas Negeri Jakarta and Universitas Negeri Semarang (4 articles each), along with Universiti Kebangsaan Malaysia (6 articles), confirm that Asian countries are leading the way in producing literature on the implementation and challenges of Digital Literacy in EFL contexts. This geographic concentration strongly indicates that the issue of technology-based language-learning transformation—the central focus of our research—is highly relevant and pressing in countries

experiencing digital acceleration and large populations of EFL learners. However, the involvement of institutions from Europe (such as the Universidad de Córdoba and the University of Münster) and the Middle East (the University of Tehran) demonstrates that this issue is a global phenomenon that requires cross-cultural comparison. Therefore, this research on Digital Literacy in the EFL Classroom is of great importance; The aim is to make a specific contribution to understanding regional dynamics (especially in Asia), the center of research production, while still offering a perspective that can be compared with findings from other parts of the world. This can be seen in the co-occurrence network of digital literacy and EFL, a theme of much research focus in the five years 2021-2025, as shown in Figure 5 below.

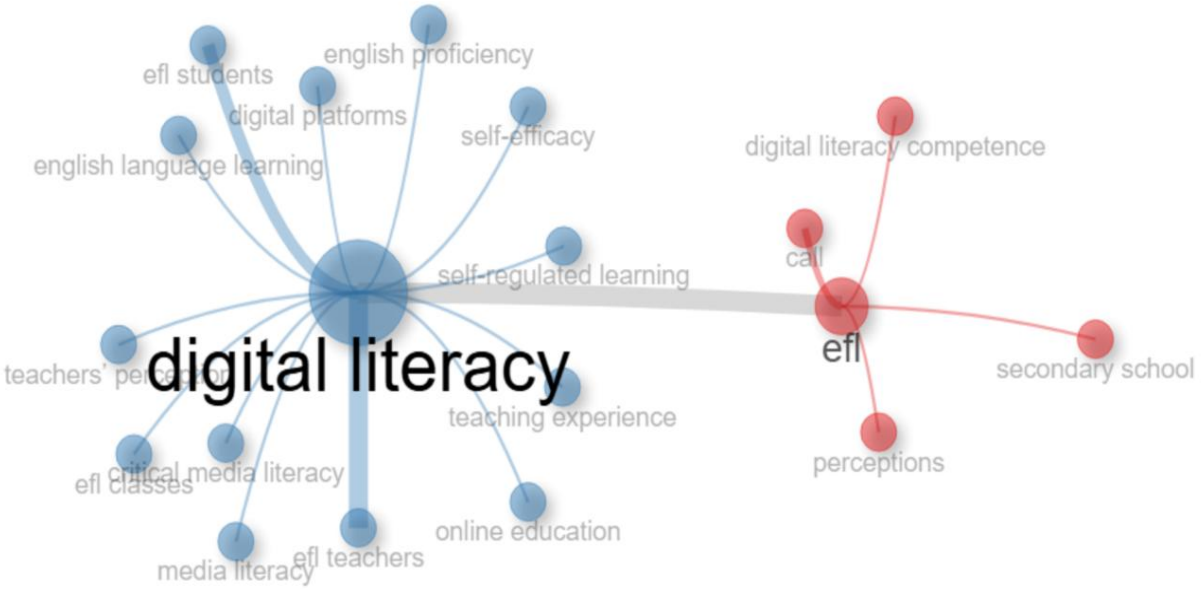

Figure 5. Co-occurrence network from digital literacy and EFL

The Co-occurrence network visualization in Figure 5 above clearly maps the main thematic structure in the literature on Digital Literacy and EFL, which directly guides the research focus. The network is divided into two main, interconnected clusters. The Blue (Dominant) Cluster is strongly centered on the term "digital literacy," which serves as the most important connection point. This cluster is associated with core pedagogical and subject concepts such as "self-regulated learning," "self-efficacy," "online education," and "English language learning." The thickness of the line between "digital literacy," "self-regulated learning," and "EFL teachers" indicates that current research is most active on student learning autonomy and the role of teacher competence in digital environments.

Meanwhile, the Red (Secondary) Cluster is centered on the acronym "EFL" and is closely connected to "digital literacy competence" and "CALL" (Computer-Assisted Language Learning). The connection between the two clusters through the central nodes of "self-regulated learning" and "EFL" confirms that the learning transformation in this study is not limited to tool adoption (CALL), but also encompasses deeper psychological and pedagogical aspects, such as self-efficacy, perception, and student autonomy. Based on this, this study is highly relevant because it operates at the center of the thematic network, focusing explicitly on how Digital

Literacy becomes a catalyst that connects technical aspects (digital platforms) with pedagogical outcomes (transforming technology-based language learning), to ensure that transformation efforts truly produce independent (self-regulated) and competent EFL learners. The thematic map in this study visualizes key findings, as shown in Figure 6 below.

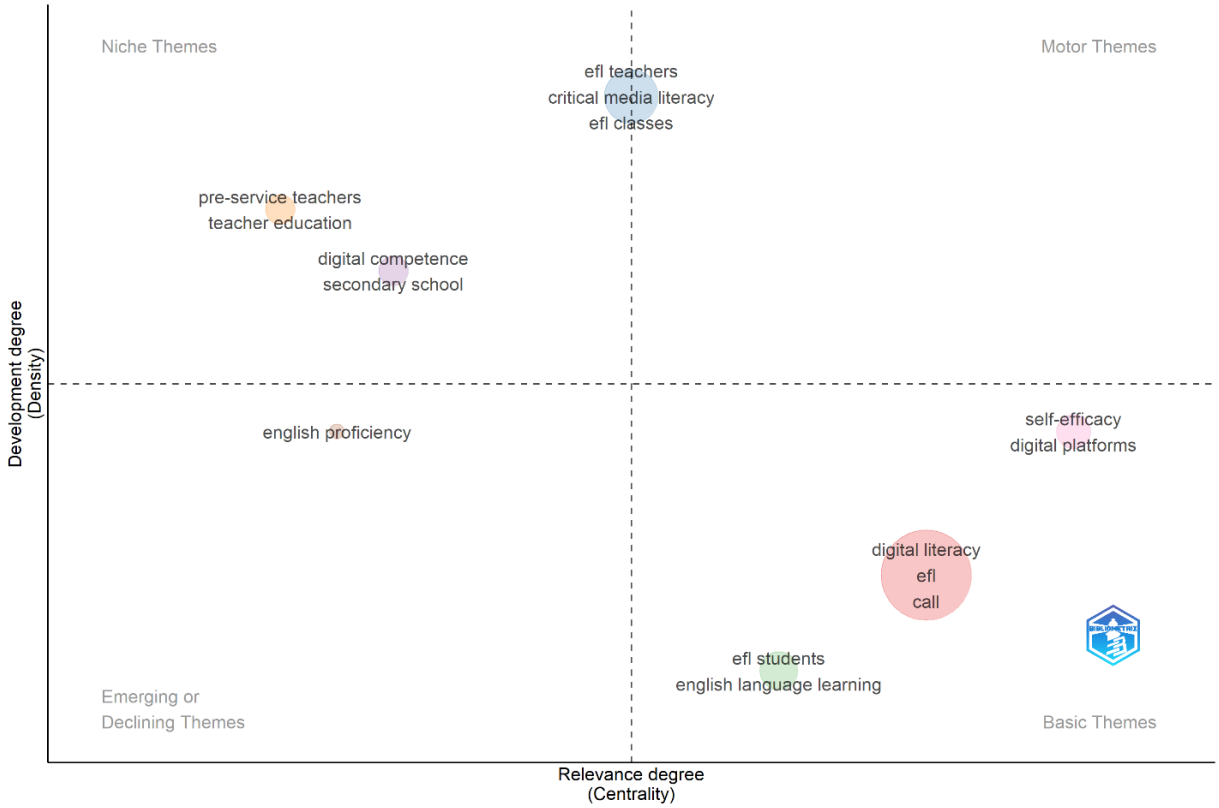

Figure 6. Thematic map

Figure 6 in the thematic map above shows that the core clusters of "digital literacy," "EFL," and "call" are located in the Basic Themes quadrant. This position confirms that these themes are highly relevant and serve as a key foundation in academic discourse; however, their relatively low density suggests that more in-depth, specific studies are needed. In contrast, the Motor Themes cluster in the upper right quadrant—including "self-efficacy" and "digital platforms"—shows high centrality and density, indicating that these themes are key drivers of current research progress. Meanwhile, themes such as "EFL teachers," "critical media literacy," and "teacher education" are located in the Niche Themes quadrant. Although the Niche themes are well-structured (high density), their lower centrality suggests that their full integration into the larger research network still requires encouragement. Thus, our research, which focuses on Technology-Based Language Learning Transformation, takes a very strategic position: firmly rooted in the Basic theme (digital literacy and EFL), but explicitly aims to integrate and develop the Motor theme (self-efficacy as an impact of transformation) and the Niche theme (teacher competency), ensuring that the contribution of digital literacy research goes beyond basic descriptions and directly drives innovation and future thematic development. Viewed from the

Countries' Collaboration World Map, the highest level of collaboration in digital literacy research in EFL is shown in Table 2 below.

Table 2
Countries' collaboration world map.

From	To	Frequency
Indonesia	Australia	134.4910001
Germany	New Zealand	121.4849235
Iran	Malaysia	109.6976228
Iran	China	103.8190735
Malaysia	Thailand	101.0028813
Malaysia	Canada	-98.30777028
Iran	Canada	-98.30777028
Iraq	Oman	56.09166155
Czech Republic	Oman	56.09166155
Iraq	Czech Republic	15.31240163

Source: Scopus CSV data with RStudio software by the Author, 2025

The analysis of cross-country collaboration data confirms the existence of strong regional research networks, particularly in Southeast Asia. This is evident in the high frequency of collaborations between Indonesia and Australia (134.49) and between Malaysia and Thailand (101.00). These intense connections are highly relevant to EFL digital literacy research, as they clearly demonstrate that the issue of technology-based language learning transformation is a top priority and a cross-border concern in the Asia-Pacific region. Furthermore, Iran emerged as an active contributor, establishing significant partnerships with both Asian (China, Malaysia) and Western (Canada) countries. However, we noted a negative frequency in some relationships that warrants further investigation. The existence of these collaborative relationships—including the highest frequency between Germany and New Zealand (171.48)—demonstrates that efforts to improve the implementation of Digital Literacy are a widespread global phenomenon. This collaboration map confirms that the study of the impacts, challenges, and strategies for enhancing digital competency is a collective, international effort. Therefore, research on Digital Literacy in the EFL Classroom is essential; it not only contributes to the dominant regional dynamics (Asia) but also offers findings that can be tested and applied to global contexts, leveraging this vast network of knowledge to foster innovative pedagogical practices.

The analysis shows that the number of publications in 2022–2023 is not simply an increase in quantity, but reflects a phase of epistemic consolidation in the study of Digital Literacy in EFL (Dashtestani & Hojatpanah, 2022; Nguyen & Habók, 2022). The rapid academic response following the pandemic indicates that digital transformation in language learning is no longer a temporary issue but a structural shift in the global English-language education paradigm (Rashid et al., 2025). The predominance of research focused on measuring students' digital competence suggests that the field's early development remains essentially diagnostic—mapping literacy levels and contextual variations across (Falloon, 2020; Spante et al., 2018). However, the most notable finding is the high citation impact of studies integrating Mobile-Assisted

Language Learning (MALL) and Self-Directed Learning, which positions learner autonomy and technological mobility as a strategic foundation for adaptive and flexible language-learning models (K.-O. Jeong, 2022).

The shift in focus from students to teachers, alongside the emergence of pedagogical frameworks such as TPACK-SAMR, marks a transition toward a reconstructive phase in the field (Hambabi et al., 2025; Humes, 2017). This shift indicates that the discourse is evolving from questioning students' digital literacy levels to examining how pedagogical systems and teacher capacities can transform digital literacy into meaningful instructional practice. The high citation density within a short time frame further confirms that technology-based language-learning transformation has become a central and multidimensional concern in contemporary academic discourse (Hasumi & Chiu, 2024; Mohsen et al., 2024). Overall, the field is moving beyond competency measurement toward integrating pedagogical models, learner autonomy, and redefining teachers' roles within the digital ecosystem.

5. Conclusion

Digital literacy in EFL classrooms as a means of transforming technology-based language learning has emerged as a critical issue in response to rapid technological advancements and the growing demand for instructional innovation. This study reveals that existing research on digital literacy in EFL remains limited and fragmented, leaving teachers and learners to navigate technological integration primarily through independent adaptation.

Conceptually, this study contributes to EFL digital literacy research by repositioning digital literacy not merely as a technical skill but as a transformative epistemic competence that underpins technology-based innovation in language learning. It frames digital literacy as a structural foundation for learner autonomy, pedagogical adaptation, and instructional redesign in the digital era. Methodologically, this research contributes through a bibliometric mapping of 55 relevant datasets, providing a systematic knowledge landscape that identifies research trends, dominant themes, citation impact, and emerging shifts from student-centered measurement toward teacher-centered pedagogical integration. This mapping offers a macro-level evidence base for understanding the evolution and trajectory of digital literacy scholarship in EFL over the past five years.

The implications of this study are threefold. For researchers, the findings highlight the necessity of moving beyond diagnostic competency studies toward integrative, mixed-methods research capable of capturing classroom transformation processes. For teacher education, the study underscores the urgency of strengthening digital pedagogical competence through structured professional development aligned with adaptive and critical digital literacy frameworks. For policymakers, the results emphasize the importance of institutional support, curriculum integration, and strategic digital literacy policies to ensure sustainable and equitable technology-based language learning transformation. Future studies employing mixed-methods approaches are strongly recommended to deepen contextual and practical understandings of how digital literacy can effectively drive innovation in EFL classrooms.

Declaration on the use of AI

This article used AI assistance, such as Grammarly, to improve the academic soundness of its language structure. ChatGPT helps provide a roadmap, not instant analysis.

References

Alavi, S. M., Dashtestani, R., & Mellati, M. (2022). Crisis and changes in learning behaviours: Technology-enhanced assessment in language learning contexts. *Journal of Further and Higher Education*, *46*(4), 461–474. https://doi.org/https://doi.org/10.1080/0309877X.2021.1985977

Anggeraini, Y., Faridi, A., Mujiyanto, J., & Bharati, D. A. L. (2019). The teachers' perceptions on digital literacy competences in EFL classroom. *Asian EFL Journal*, *24*(4), 5–12.

Bellet, M., Belfakir, L., & Belghmi, M. (2025). *Students' Perceptions of EFL Teachers' Online Effectiveness in Post-COVID-19 Moroccan Higher Education*. https://doi.org/https://dx.doi.org/10.24093/awej/vol16no1.14

Bond, M., Zawacki-Richter, O., & Nichols, M. (2019). Revisiting five decades of educational technology research: A content and authorship analysis of the British Journal of Educational Technology. *British Journal of Educational Technology*, *50*(1), 12–63. https://doi.org/https://doi.org/10.1111/bjet.12730

Carolus, A., Augustin, Y., Markus, A., & Wienrich, C. (2023). Digital interaction literacy model–Conceptualizing competencies for literate interactions with voice-based AI systems. *Computers and Education: Artificial Intelligence*, *4*(1), 100114. https://doi.org/https://doi.org/10.1016/j.caeai.2022.100114

Dashtestani, R., & Hojatpanah, S. (2022). Digital literacy of EFL students in a junior high school in Iran: voices of teachers, students and Ministry Directors. *Computer Assisted Language Learning*, *35*(4), 635–665. https://doi.org/10.1080/09588221.2020.1744664

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*(3), 285–296. https://doi.org/https://doi.org/10.1016/j.jbusres.2021.04.070

Erümit, A. K., Cebeci, H. Y., & Özmen, S. (2024). Big data in higher education: Bibliometric analysis. *TechTrends*, *68*(6), 1129–1139. https://doi.org/10.1007/s11528-024-01006-4

Esfandiari, R., & Meihami, H. (2023). Iranian EFL teachers' challenges and solutions in using computer-assisted assessment: Exploring EFL teachers' experiential evidence. In *Handbook of CALL Teacher Education and Professional Development: Voices from Under-Represented Contexts* (pp. 313–329). Springer Nature. https://doi.org/10.1007/978-981-99-0514-0_19

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472. https://doi.org/https://doi.org/10.1007/s11423-020-09767-4

Feng, L. (2024). Modeling the contribution of EFL students' digital literacy to their foreign language enjoyment and self-efficacy in online education. *Asia-Pacific Education Researcher*, *33*(4), 977–985. https://doi.org/10.1007/s40299-023-00787-1

Flamarique, M. L., Egaña, T., & Larrañaga, E. G. (2019). Search, evaluation and selection of digital information in a secondary classroom: Tensions between the practice and the discourse of teachers and students. *Digital Education Review*, *36*, 36–50.

George, A., & Sanders, M. (2017). Evaluating the potential of teacher-designed technology-based tasks for meaningful learning: Identifying needs for professional development. *Education and Information Technologies*, *22*(6), 2871–2895. https://doi.org/https://doi.org/10.1007/s10639-017-9609-y

Gilster, P., & Glister, P. (1997). *Digital literacy*. Wiley Computer Pub. New York.

Gisbert, C. M., & Lázaro, C. J. L. (2015). Professional development in teacher digital competence and improving school quality from the teachers' perspective: a case study. *Journal of New Approaches in Educational Research*, *4*(2), 115–122. https://doi.org/https://doi.org/10.7821/naer.2015.7.123

Gruszczynska, A., & Pountney, R. (2013). Developing the concept of digital literacy in the context of schools and teacher education. *Enhancing Learning in the Social Sciences*, *5*(1), 25–36. https://doi.org/https://doi.org/10.11120/elss.2013.05010025

Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: implications for teacher education. *European Journal of Teacher Education*, *41*(2), 214–231. https://doi.org/https://doi.org/10.1080/02619768.2017.1416085

Gurevich, I., Stein, H., & Gorev, D. (2017). Tracking professional development of novice teachers when integrating technology in teaching mathematics. *Computers in the Schools*, *34*(4), 267–283. https://doi.org/https://doi.org/10.1080/07380569.2017.1387470

Hafour, M. F. (2022). The effects of MALL training on preservice and in-service EFL teachers' perceptions and use of mobile technology. *ReCALL*, *34*(3), 274–290. https://doi.org/10.1017/S0958344022000015

Halpern, D., Piña, M., & Ortega-Gunckel, C. (2020). School performance: New multimedia resources versus traditional notes. *Comunicar*, *28*(64), 37–46. . https://doi.org/10.3916/C64-2020-04

Hambabi, A., Osakwe, J., & Nhinda, G. (2025). A hybrid model for integrating SAMR and TPACK models in education. *International Journal of Arts and Social Sciences*, *1*(1), 1–11.

Hassan, W., & Duarte, A. E. (2024). Bibliometric analysis: a few suggestions. *Current Problems in Cardiology*, *49*(8), 102640. https://doi.org/https://doi.org/10.1016/j.cpcardiol.2024.102640

Hasumi, T., & Chiu, M.-S. (2024). Technology-enhanced language learning in English language education: Performance analysis, core publications, and emerging trends. *Cogent Education*, *11*(1), 2346044. . https://doi.org/https://doi.org/10.1080/2331186X.2024.2346044

Huang, F., & Derakhshan, A. (2025). Learning motivation and digital literacy in ai adoption for self-regulated english learning. *European Journal of Education*, *60*(4), e70254. https://doi.org/https://doi.org/10.1111/ejed.70254

Humes, V. (2017). *The impact of TPACK, SAMR, and teacher effectiveness on student academic growth in eighth grade language arts and mathematics* [Youngstown State University]. https://www.proquest.com/docview/2572566969?fromopenview=true&pq-origsite=gscholar&sourcetype=Dissertations & Theses

Hutchinson, L., & Novotny, M. (2018). Teaching a critical digital literacy of wearables: A feminist surveillance as care pedagogy. *Computers and Composition*, *50*(2), 105–120. https://doi.org/https://doi.org/10.1016/j.compcom.2018.07.006

Hutchison, A. (2012). Literacy teachers' perceptions of professional development that increases

integration of technology into literacy instruction. *Technology, Pedagogy and Education*, *21*(1), 37–56. https://doi.org/https://doi.org/10.1080/1475939X.2012.659894

Ilomäki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence–an emergent boundary concept for policy and educational research. *Education and Information Technologies*, *21*(3), 655–679. https://doi.org/https://doi.org/10.1007/s10639-014-9346-4

Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education*, *67*(3), 37–45. https://doi.org/https://doi.org/10.1016/j.tate.2017.05.016

Javed, F. (2024). Digital transformation in teaching and learning of english in higher education. In *Digital Transformation in Higher Education, Part B: Cases, Examples and Good Practices* (pp. 103–125). Emerald Publishing. https://doi.org/10.1108/978-1-83608-424-220241005

Jeong, K.-O. (2022). Facilitating sustainable self-directed learning experience with the use of mobile-assisted language learning. *Sustainability (Switzerland)*, *14*(5), 1–13. https://doi.org/10.3390/su14052894

Jeong, Kyeong-Ouk. (2017). Preparing EFL student teachers with new technologies in the Korean context. *Computer Assisted Language Learning*, *30*(6), 488–509. https://doi.org/https://doi.org/10.1080/09588221.2017.1321554

Katsarou, E. (2021). The effects of computer anxiety and self-efficacy on L2 learners' self-perceived digital competence and satisfaction in higher education. *Journal of Education and E-Learning Research*, *8*(2), 158–172. https://doi.org/10.20448/JOURNAL.509.2021.82.158.172

Kurniadi, D., Yuliasri, I., Wahyuni, S., & Sakhiyya, Z. (2025). Contriving IT-based integrated skills approach (ITBISA) for students' English proficiency and digital literacy skills. *Qubahan Academic Journal*, *5*(1), 782–797. https://doi.org/10.48161/qaj.v5n1a1595

Lai, C., Shum, M., & Tian, Y. (2016). Enhancing learners' self-directed use of technology for language learning: the effectiveness of an online training platform. *Computer Assisted Language Learning*, *29*(1), 40–60. https://doi.org/10.1080/09588221.2014.889714

List, A. (2019). Defining digital literacy development: An examination of pre-service teachers' beliefs. *Computers & Education*, *138*(3), 146–158. https://doi.org/https://doi.org/10.1016/j.compedu.2019.03.009

Milenkova, V., Manov, B., & Peicheva, D. (2020). Shaping digital literacy in knowledge society. In A. T., T. R., G.-B. V., & A. K. (Eds.), *Advances in Intelligent Systems and Computing: Vol. 1152 AISC* (pp. 279–284). Springer. https://doi.org/10.1007/978-3-030-44267-5_42

Mohsen, M. A., Althebi, S., Alsagour, R., Alsalem, A., Almudawi, A., & Alshahrani, A. (2024). Forty-two years of computer-assisted language learning research: A scientometric study of hotspot research and trending issues. *ReCALL*, *36*(2), 230–249.

Murphy, J., & Lebans, R. (2009). Leveraging new technologies for professional learning in education: Digital literacies as culture shift in professional development. *E-Learning and Digital Media*, *6*(3), 275–280. https://doi.org/https://doi.org/10.2304/elea.2009.6.3.275

Muslimin, A. I., Mukminatien, N., & Ivone, F. M. (2023). TPACK-SAMR digital literacy competence, technostress, and teaching performance: Correlational study among EFL lecturers. *Contemporary Educational Technology*, *15*(2), 1–15. https://doi.org/10.30935/cedtech/12921

Nguyen, L. A. T., & Habók, A. (2022). Digital literacy of efl students: an empirical study in

vietnamese universities. *Libri*, *72*(1), 53–66. https://doi.org/10.1515/libri-2020-0165

Özdoğan Sarıkoç, G. (2024). Artificial intelligence applications in the field of streamflow: a bibliometric analysis of recent trends. *Hydrological Sciences Journal*, *69*(9), 1141–1157. https://doi.org/10.1080/02626667.2024.2356006

Palacios-Hidalgo, F. J., & Huertas-Abril, C. A. (2025). Developing digital literacy in initial EFL teacher education: A study in a Spanish distance university. *Open Learning: The Journal of Open, Distance and e-Learning*, *40*(1), 50–66. https://doi.org/https://doi.org/10.1080/02680513.2022.2157709

Pérez-Escoda, A., García-Ruiz, R., & Aguaded, I. (2019). Dimensions of digital literacy based on five models of development/Dimensiones de la alfabetización digital a partir de cinco modelos de desarrollo. *Culture and Education*, *31*(2), 232–266. https://doi.org/https://doi.org/10.1080/11356405.2019.1603274

Pettersson, F. (2018). On the issues of digital competence in educational contexts–a review of literature. *Education and Information Technologies*, *23*(3), 1005–1021. https://doi.org/https://doi.org/10.1007/s10639-017-9649-3

Prosenjak, B., & Jakupčević, E. (2025). Attitudes of primary and secondary EFL teachers in croatia towards the use of ai in classroom settings. *ELOPE: English Language Overseas Perspectives and Enquiries*, *22*(1), 133–150. https://doi.org/https://doi.org/10.4312/elope.22.1.133-150

Rashid, M., Sajid, J., Nadeem, I., & Khan, J. (2025). Need analysis of digital communication tools in real world context: A study of usability, practices and perception of Pakistani higher education aspirants of English majors. *Liberal Journal of Language & Literature Review*, *3*(1), 472–514.

Saykili, A. (2024). Continuous teacher professional development in a time of digitalization and global health crisis. In *Embracing Technological Advancements for Lifelong Learning* (pp. 83–110). IGI Global. https://doi.org/10.4018/979-8-3693-1410-4.ch005

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, *5*(1), 1519143. https://doi.org/https://doi.org/10.1080/2331186X.2018.1519143

Suyanto, E., Fuad, M., & Antrakusuma, B. (2023). Exploring the research trends of technological literacy studies in education: A systematic review using bibliometric analysis. *International Journal of Information and Education Technology (IJIET)*, *13*(6), 914–924. https://doi.org/10.18178/ijiet.2023.13.6.1887

Zhang, J. (2023). EFL teachers' digital literacy: the role of contextual factors in their literacy development. *Frontiers in Psychology*, *14*(1), 1–11. https://doi.org/10.3389/fpsyg.2023.1153339

Zimmer, W. K., McTigue, E. M., & Matsuda, N. (2021). Development and validation of the teachers' digital learning identity survey. *International Journal of Educational Research*, *105*(1), 101717. https://doi.org/https://doi.org/10.1016/j.ijer.2020.101717